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TO: Internal File

THRU: Peter H. Hess, Reclamation Specialist, Team Lead

FROM: Wayne H. Western, Senior Reclamation Specialist *W H W*

RE: Response to Division Order DO00A, West Ridge Resources, Inc., West Ridge Mine, C/007/041-DO00A-4

SUMMARY:

On July 14, 2000, the Division received the response to Division Order DO00A-1 that dealt with as-built drawings and slope stability analyses for the West Ridge mine. The Division found several deficiencies on the as-built maps and slope stability analysis and sent the permittee a deficiency letter. On March 18, 2001, the Division received the permittee's response. The permittee stated that they did not have all the information that the Division requested. The Division reviewed the slope stability analysis and found several deficiencies with the proposed reclamation plan. Other deficiencies were also noted.

On July 2, 2001 the Division received a deficiency response to round 3. In that response the permittee included a highwall reclamation plan which included a detailed slope stability analysis performed by Agapito Associates, Inc. The Division reviewed the slope stability analysis and found several concerns relative to its relationship with the submitted reclamation proposal. Other deficiencies were also noted.

TECHNICAL ANALYSIS:

RECLAMATION PLAN

BACKFILLING AND GRADING

Regulatory Reference: 30 CFR Sec. 785.15, 817.102, 817.107; R645-301-234, -301-537, -301-552, -301-553, -302-230, -302-231, -302-232, -302-233.

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Analysis:

The permittee originally proposed to create highwalls that were smaller than those constructed. During construction, the permittee discovered that the coal near the outcrop had been burned more extensively than was originally anticipated. The permittee could not follow the approved mine plan because it did not anticipate the extent of coal burn discovered. In turn, it was necessary to construct a larger highwall. The permittee also constructed a safety bench to protect employees and machinery in this area from falling debris. The Division's major concern was whether or not the highwall could be properly reclaimed to R645 standards. Therefore, the Division required the permittee to do a submit a revised reclamation plan that has a detailed plan for reclaiming the highwalls, including a slope stability study for the highwall area.

In the July 2, 2001 submittal, the Permittee included Appendix 5-9, West Ridge Mine Proposed Highwall Reclamation Plan. The plan was prepared by Agapito Associates, Inc. (AAI), who had done the original slope stability work. The highwall reclamation plan includes the following:

Existing Conditions:

The portal excavation consists of a rock highwall approximately 58' in height at an angle of 68° from horizontal. The highwall is comprised primarily of sandstone with the face roughly parallel to the dip of the bedding. An MSHA safety bench approximately 25' in width has been constructed above the portals at the base of the slope to protect miners from potential rockfall.

Although minor rockfall is evident on the bench, the highwall shows no signs of instability such as tension cracks or raveling. The existing slope is dry, and no water flow or seepage has been noted on the slope to date.

Proposed Reclamation Plan:

The following is the proposed plan of reclamation for this highwall. The plan is based on recommendations and technical information provided in the attached Agapito report.

- 1. The highwall will be backfilled using clean, angular rockfill as recommended in the report. This backfill will be per the specifications and gradation as prescribed by the report.*
- 2. The angular rock backfill will be placed in lifts of 1' to 3' thick, and will be compacted by wheeled loader where width allows. Placement and compaction of the upper, narrower portion of the fill will be accomplished with a trackhoe.*
- 3. The backfill will extend from the prescribed toe of the slope to the top of the excavation. The reclaimed section will reach a height of approximately 58' at an angle of approximately 40° for horizontal, as shown on Figure 1*
- 4. In order to help ensure the minimum 1.3 static safety factor over this height and angle, the surface of the highwall backfill will not be covered with soil, and will*

not be revegetated soil. Soil covering for overall vegetation and even "pocket" vegetation may result in eventual filling of the voids in the backfill and affect the free-draining nature of the fill, thus reducing the safety factor.

- 5. The reclaimed highwall will have the appearance of a "talus slope", which is compatible with other slopes in the area.*
- 6. The reclamation of the highwall in accordance with this plan will meet the requirements of R645-301-553 by achieving the Approximate Original Contour, eliminating all highwalls, achieving a long-term static safety factor of 1.3, minimizing erosion and water pollution (angular, durable rock fill), and supporting the approved postmining land use (wildlife habitat.)*
- 7. It should be noted that under this plan, no special provisions are made to divert or otherwise prevent water infiltration from the backfill. Since it is nearly impossible to guarantee success of such controls even after bond release, the use of a stable, free-draining angular rock backfill is a much more desirable and permanent reclamation technique in this instance.*
- 8. The highwall will be visually monitored through the life of the mine for signs of instability or seepage. More intensive monitoring and reporting will only be implemented if the highwall shows signs of instability, which could affect the safety of the personnel or the success of the reclamation.*

AAI report states that the height of the highwall shown on Figure 1 is 58 feet. While the highwall height is 58 feet, the slope associated with the reclaimed highwall is 75 vertical feet.

Attached to the proposed highwall reclamation plan is Revision No. 1 Stability Evaluation for the Proposed Reclaimed Slope at the Portal Excavation. In the report, the consultant shows the result of a slope stability analysis for the reclaimed highwalls. The results of the analysis are as follows:

1. The reclaimed highwall will have a static safety factor of 1.31. The Division requires that the slope have a minimum static safety factor of 1.3
2. The reclaimed slope will have a pseudostatic (earthquake load) of 1.1. The Division does not have requirements for earthquake load for reclaimed slopes. However, that information is useful for evaluating the general backfilling and grading requirements as well as evaluating AOC.

In the slope stability report the consultant has made the following recommendations:

1. The backfill material should be a clean angular rockfill that is free of fines. The specific gradation (partial size distribution) is listed on Table 1 of the slope stability study.
2. The backfill material should be placed in thin lifts between 1 and 3 feet thick. Where the width of the backfill permits, the backfill should be placed by a front-end-loader. As the fill narrows, placement by a skilled trackhoe operator is recommended.
3. The backfill should be compacted by wheel-rolling rubber tire equipment when possible, and compacted by tamping by a trackhoe bucket elsewhere.
4. The reclaimed slope should be concave instead of straight and be free of vegetation or soil. If vegetation is needed then small pockets should be created and filled with soil.
5. Laborers should not be allowed on the slope for several months after the work is

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5. Laborers should not be allowed on the slope for several months after the work is completed.
6. If achieving the full slope height becomes difficult due to instability during construction, it should be acceptable to limit the backfill height to some distance below the crest of the current wall.
7. All construction equipment should be OSHA compliant. A full time rock spotter should be used during construction.
8. A geotechnical engineer with a strong background in slope stability should manage the reclamation of the highwall area.
9. The existing slope should be visually monitored for indications of groundwater above the base of the slope.
10. The backfill should be monitored visually and by surveying techniques during the post-reclamation monitoring period.

The Division has reviewed the highwall reclamation plan and made the following findings:

1. The Division agrees with the proposal to use clean angular rocks for backfill because 1) the material has a high internal angle of friction that is needed for stability, 2) angular rock tends to pack better (few void spaces) than rounded rock and 3) rock will provide a free draining material that will prevent the buildup of positive pore water pressure.
2. The permittee did not state where the backfill material for the highwalls would come from, nor did they state how they would ensure that all material would meet the specifications outlined in Table 1 of the Agapito report. The Division needs that information to determine reclamation costs and if additional areas must be permitted in order to obtain that material.
3. The permittee needs to establish a measurable compaction standard. The Division has concerns that a wheeled vehicle (a front end loader) could not achieve the desired compaction rate because they do not transmit enough weight per unit area to achieve adequate compaction. Rock material is best compacted using vibrating equipment rather than rolling equipment.
4. The AAI report recommends that the reclaimed slopes be stable but the cross sections show that the reclaimed highwall area (Station 23+00 to 27+00) will have straight to slightly convex slopes. The permittee needs to redesign the reclaimed slopes in order to comply with the AAI recommendation of concave slopes.
5. R645-301-553.120 requires that all post-SMCRA highwalls be eliminated.
6. The permittee needs to incorporate the recommended safety procedures into the reclamation plan.
7. The permittee needs to commit to have a geotechnical engineer, who is experienced in slope stability, be responsible for all construction activities during the reclamation of the highwall area.
8. The permittee must commit to monitoring for groundwater in the existing highwall until any noted water sources are covered during the backfilling of the area.
9. The permittee must describe the slope stability monitoring program that will be used during the monitoring and maintenance period.

10. The Division agrees with the claims in the AAI report that the angle-of-repose of the rock backfill will be 43° to 45° . The slope angles for the reclaimed highwall area will not exceed 40° .
11. The Division agrees with the finding in the AAI report that the slope in Figure 1 will have a minimum static safety factor of 1.3.
12. The height of the reclaimed slope shown in Figure 1 is 75 feet. The height of the reclaimed slope as depicted at Station 24+00 on Map 5-6B, is 105 feet. The 105 foot high reclaimed slope is the worst case scenario. Since the safety factor for the slope in Figure 1 is just 1.31, the permittee must show that the reclaimed slope which reaches the height of 105 foot can also achieve the minimum long term static safety factor of 1.3. Therefore, the permittee must provide the Division with additional information.
13. The permittee's proposal is to reclaim the highwall area to a "talus slope", *which is compatible with other slopes in the area*. The permittee needs to identify these other talus slopes in the area which are being referenced. This would aid the Division in making a determination that adequate justification exists in order to approve the reclamation of the slope to a talus configuration. Otherwise, the permittee must address the necessary requirements to revegetate the reclaimed slope. In order to meet the requirements of the R645 coal rules relative to revegetation and the long term static safety factor, it may be necessary to reconfigure the reclamation plan for the highwall area.

Findings:

The information in the proposed amendment is not considered adequate to meet the requirements of this section. The permittee must provide the following in accordance with:

R645-301-542.200, The permittee must give the Division a detailed backfilling and grading plan for the highwall area that includes the following: (1) The permittee must state where the rock material that will be used to backfill the highwalls will come. (2) The permittee must show that the material used to backfill the highwall will meet the requirements of the AAI slope stability report including the gradation specification listed on Table 1. The permittee must also state how those material specifications, as described in the AAI slope stability analysis, will be ensured. (3) The permittee must state what compaction specifications are felt to be necessary and how they will be obtained and verified in the field. (4) The permittee must state what safety programs will be used during reclamation of the highwall area. The safety program should include the recommendations in the AAI report. (5) The permittee needs to commit to have a geotechnical engineer who is experienced with slope stability be responsible for all construction activities at the site during the reclamation of the highwall. (6) The permittee must give the Division a detailed plan for monitoring the highwall for groundwater. (7) The permittee must state how they will monitor the reclaimed highwalls for stability.

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R645-301-553.120, The Permittee must commit to eliminate the entire highwall. If rock fill cannot be placed at the top of the slope due to instability, then the permittee will have to modify the reclamation plan so that the highwall will be eliminated.

R645-301-553.130, The permittee must show that the slope at Station 24+00 as depicted on Map 5-6B will have a safety factor of 1.3 or greater. The Division is concerned about the slope on Station 24+00 because it is higher than the slope used in the stability analysis. The slope used in the stability analysis has a height of 74 feet, while the highest slope is 105 feet. The slope stability analysis must critique the highest slope or worst case scenario.

R645-301-830.140, The permittee must provide the Division with detailed earthwork calculations for the reclamation of the highwalls. The earthwork calculations must include enough detail to show that conventional equipment can be used to place the backfill material against the highwall so that all engineering specifications, including those relative to compaction, will be met.

RECOMMENDATIONS:

Division Order DO00A should remain in effect until the permittee has adequately addressed all the issues in this memo.